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Case Report

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A successful falciparum malaria treatment with hemodiafiltration in an African patient

Alparslan Koç

Department of Anesthesiology and Reanimation, Erzincan Binali Yıldırım University Mengucek Gazi Training and Research Hospital, Erzincan, Turkey

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Corresponding Author: Alparslan Koç, dralparslankoc@gmail.com

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ABSTRACT

Malaria is a serious infectious illness that has existed since ancient times. Despite its prevalence in Sub-Saharan Africa, it remains a global public health issue. However, *Plasmodium falciparum* causes the most severe and fatal form of malaria, accounting for almost 80% of global mortality. Malarial acute kidney injury (AKI) caused by malaria can progress rapidly. An early initiation to renal replacement therapy is advised because AKI induced by malaria may worsen fast. This paper report a successful severe malaria therapy with hemodiafiltration in the ICU of an African student studying in Turkey. The patient, whose blurring of consciousness increased and Glasgow coma scale (GCS) decreased GCS=8, was admitted to the anesthesiology and reanimation ICU. The patient was treated for 3 days with malaria medications and continuous renal replacement therapy (CRRT). Malaria persists everywhere, especially among nonimmunized people. AKI is common in malaria patients. Patients with severe malaria should be examined for renal involvement, including electrolyte abnormalities and fluid overload. Supportive treatment is recommended for oliguric AKI. If feasible, CRRT may help these patients.

Keywords: Malaria, *Plasmodium falciparum*, acute kidney injury, hemodiafiltration

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INTRODUCTION

Malaria is a serious infectious illness that has existed since ancient times. Over three million individuals in over 100 countries are infected with this parasitic illness, which causes over 400 thousand fatalities annually. Despite its prevalence in Sub-Saharan Africa, it remains a global public health issue.[1] *Plasmodium falciparum*, Plasmodium vivax, Plasmodium ovale, Plasmodium malaria, and Plasmodium knowlesi are the five human parasites. However, *P. falciparum* produces the most severe and life-threatening type of malaria and is responsible for more than 80% of malaria deaths worldwide.[2] Mortality is linked to the degree of parasitaemia. Case fatality rates are higher in patients with high parasite densities. If the parasite count is greater than 10%, exchange transfusions may be helpful, as they eliminate parasitemia faster than optimum treatment alone.[3] The diagnosis of malaria underlines the value of early diagnosis and treatment in easing patient suffering. The gold standard for diagnosing malaria is a peripheral blood smear.[4] Although the pathophysiology of malarial acute kidney injury (AKI) is unknown, many pathways have been hypothesized. Hypotheses include hemodynamic (mechanical changes, immune-mediated glomerular damage, and metabolic changes.[5] Fluid overload [pulmonary edema, heart failure), refractory electrolyte imbalances (hyperkalemia, metabolic acidosis), or symptomatic uremia may require specialist therapy such as dialysis. Malaria causes hypercatabolism in these patients, increasing their requirement for dialysis. Because AKI caused by malaria can progress rapidly, it is recommended to start renal replacement treatment as soon as possible.[6] We will present the successful severe malaria treatment that we applied with hemodiafiltration in the intensive care unit (ICU) of a university student who came to Turkey from Africa for education.

CASE

22-year-old man came to Turkey from the Republic of Guinea-Bissau, one of the West African countries, for university education. The patient, who applied to the emergency department due to confusion and fever, was hospitalized by the infectious diseases clinic. In his story, he stated he returned from his country three days ago and that his fever started while he was in his country. After examinations, the patient was diagnosed with *P. falciparum* malaria. The patient, whose blurring of consciousness increased and Glasgow coma scale (GCS) decreased GCS=8, was admitted to the anesthesiology and reanimation ICU. There was no acidosis in blood gas, but the pO_2 value was 62 mmHg despite high flow oxygen support. The patient whose blurred consciousness increased in the ICU follow-up was intubated and connected to a mechanical ventilator. It was determined that the patient had no urine output, and the

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creatinine value increased from 1.3 to 4.1 within one day. Jaundice was observed in the conjunctiva, and the measured total bilirubin value was 23.28 mg/dl, of which 12.74 mg/dl was direct bilirubin. When hepatitis markers were examined, anti-HAV IgG was positive, and HBs Ag and anti-HCV were negative. Ultrasound imaging at the bedside revealed minimal hepatomegaly, and the bladder was empty.

Transfusion of 6 units of platelet suspension was applied to the patient whose platelet count decreased to 31.000. The patient's admission laboratory values are presented in **Table 1**. With the recommendation of infectious diseases, Artesunate 120 mg intravenous (IV) loading dose was followed by maintenance treatment, as Artemeter 20 mg+Lumefantrine 120 mg nasogastric 2×4 tablets. Continuous renal replacement therapy (CRRT) was decided, and a jugular dialysis catheter was applied. The device was arranged as continuous venovenous hemodiafiltration (CVVHDF). A total of 1000 ml of dialysate, 1000 ml replacement fluid, and 100 ml ultrafiltration per hour were adjusted. Malaria and supportive treatments were continued with CRRT for approximately 72 hours.

During this period, the patient was sedated for mechanical ventilation and compliance with CRRT. In the first 24 hours of CRRT, the creatinine value increased to 7.2 mg/dl and then gradually decreased and regressed to 2.3 mg/dl after CRRT. On the second day of CRRT, the hemoglobin level decreased to 6.8 mg/dl, and two units of hemoglobin suspension were transfused. Urine output started on the third day of CRRT. After CRRT was ended, sedation was stopped, and the patient waited for awakening. The patient, who was almost entirely conscious of the situation, was weaned off the mechanical ventilator. On the fifth day of hospitalization for the patient in the ICU, GCS=15 and creatinine=1.55 mg/dl. He was discharged to the infectious diseases clinic in good health (**Table 2**).

DISCUSSION

The severe and deadly consequences associated with *P. falciparum* infection make it more dangerous than other malaria species. The mortality rate shows significant variation since it is influenced by factors such as the type of infection, the characteristics of the host, the surrounding circumstances, and the quality of treatment received. When comparing cases with similar levels of severity upon admission, the outcomes tend to be more favorable in well-equipped intensive care units (ICUs) staffed by highly trained professionals, as opposed to peripheral health centers.[7] Hyperparasitaemia, Blackwater fever, renal failure, acute malarial hepatitis, adult respiratory distress syndrome, adrenal insufficiency syndrome, cardiac arrhythmias, and gastrointestinal symptoms, including secretory diarrhea, are all caused by this deadly parasite.[8] *P. falciparum* infects erythrocytes of any age, causing high-grade parasitemia. The parasite count can grow up to 20-fold in 48 hours without treatment because of its fast replication. In the therapeutic environment, parasitemia helps define severe *P. falciparum* malaria and tracks the effectiveness of antimalarial medication.[9] There is a clear association between an individual's asexual erythrocytic-stage parasite density at the time of presentation and the severity of clinical illness in *P. falciparum* malaria.[10] Here, the patient encountered the agent in his own country and came to our country within three days of his illness. Several researchers advise only considering exchange transfusion for individuals with severe parasitemia.[11] A reduction in the risk of severe intravascular hemolysis and its consequences, better rheology, reduced microcirculatory sludging, and increased oxygen carrying capacity with transfused erythrocytes are all reasons to use exchange transfusion treatment.[12] The patient was in a precoma state. We started CRRT as we can decide quickly and start the fastest. Malaria-associated AKI has a death rate of up to 51%, with the poorest prognosis being delayed referral, severe jaundice, oliguria, and multiorgan involvement.[13] Zheng et al.[14] performed successful treatment in 12 patients with CRRT combined with artesunate. A small RCT compared CRRT with peritoneal dialysis in Vietnamese patients with AKI, mainly due to malaria. Twelve CRRT patients had decreased mortality and overall expenditures.[15]

CONCLUSION

Malaria remains a global problem, particularly among nonimmunized populations. AKI is prevalent in severe malaria patients. Severe malaria patients should be continuously monitored for renal involvement, including refractory electrolyte imbalances and fluid overload. Patients with oliguric AKI should be treated with supportive therapy. CRRT may be an effective option in these patients if possible.

ETHICAL DECLARATIONS

Informed Consent: All patients signed the free and informed consent form.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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Alparslan Koç
He was born in Erzincan. He graduated from Ankara Medical Faculty in 2003. He received his specialization from Haseki Training and Research Hospital 1st Anesthesiology and Reanimation Clinic. He did his military service as a reserve officer at Tatvan Military Hospital, and then worked at Kütahya Evliya Çelebi Training and Research Hospital for 7 years. He is still working at Erzincan Binali Yıldırım University Mengücek Gazi Training and Research Hospital. He is married and has three children.